We Claim

1. An all-optical packet gate, comprising:
    a) an optical divider having first input and first and second outputs for receiving optical packets at said input and directing said packets to each of said first and said second outputs, said optical packets having encoded headers and payloads;
    b) said first output includes a decoding device for decoding one of said encoded headers of one of said optical packets and to produces a pulse in response to one of said encoded headers propagating in said first output and a copier for producing a plurality of images of said pulse, and
    c) an AND gate having second and third inputs and a third output, and
    d) said AND gate receives said plurality of images of said pulse at said second input and one of said packets at said third input to produce time coincidence between said plurality of images of said pulse and the pulses of the payload of one of said optical packets propagating in third input to produce at said third output a signal similar to one of said payloads.
2. The gate of claim 1 wherein said decoding device includes an AND gate having fourth and fifth inputs.
3. The gate of claim 2 wherein said fourth and fifth inputs are delayed by a relative time delay that is equal to the time delay between the pulses of one of said headers.
4. The gate of claim 1 wherein said AND gate further includes a threshold mechanism.

5. The gate of claim 4 wherein said threshold mechanism is a threshold selected from a group of optical thresholds and electronic thresholds.
6. The gate of claim 1 wherein said copier includes at least one one-to-many divider and at least one many-to-one combiner connected by a plurality of delay lines
7. The gate of claim 1 wherein said encoding device is irresponsive to any of said payloads.
8. An all-optical packet gate, comprising:
   a) an optical divider having first input and first and second outputs for receiving optical packets at said input and directing said packets to each of said first and said second outputs, said optical packets having encoded headers and payloads;
   b) said first output includes a decoding device for decoding one of said encoded headers of one of said optical packets and to produces a pulse in response to one of said encoded headers propagating in said first output and a broadening device having at least one stable state for converting said pulse into a wide pulse, and
   c) an AND gate having second and third inputs and a third output, and
   d) said AND gates receives said wide pulse at said second input and one of said packets at said third input to produce time coincidence between said wide pulse and the pulses of the payload of one of said optical packets propagating in said third input to produce at said third output a signal similar to one of said payloads.

9. The gate of claim 7 wherein said decoding device includes an AND gate having fourth and fifth inputs.
10. The gate of claim 8 wherein said fourth and fifth inputs are delayed by a relative time delay that is equal to the time delay between the pulses of one of said headers.
11. The gate of claim 7 wherein said AND gate further includes a threshold mechanism.
12. The gate of claim 10 wherein said threshold mechanism is a threshold selected from a group of optical thresholds and electronic thresholds.
13. The gate of claim 7 wherein said broadening device includes at least one device selected from a group of optical and electronic bistabe devices, monostable devices and toggle devices
14. The gate of claim 7 wherein said optical packets further includes encoded trailer.
15. The gate of claim 13 wherein said encoding device is responsive to said trailer.
16. The gate of claim 7 wherein said encoding device is irresponsive to any of said payloads.
17. An all-optical packet routing system, comprising:
    a) first optical divider having first input and a plurality of outputs for receiving optical packets at said first input and directing said packets to each of said plurality of outputs, said optical packets having encoded headers and payloads, and
    b) each of said plurality of outputs of said first divider includes a packet gate;
    c) said packet gate, comprising:

i. second optical divider having second input and first and second outputs for receiving said optical packets at said second input and directing said packets to each of said first and second outputs;

ii. said first output includes a decoding device for decoding one of said encoded headers of one of said optical packets and to produces a pulse in response to one of said encoded headers propagating in said first output and a copier for producing a plurality of images of said pulse, and

iii. an AND gate having third and fourth inputs and a third output, and

iv. said AND gate receives said plurality of images of said pulse at said third input and one of said packets at said fourth input to produce time coincidence between said plurality of images of said pulse and the pulses of the payload of one of said optical packets propagating in fourth input to produce at said third output a signal similar to one of said payloads.

18. The system of claim 7 wherein said system is an optical packet demultiplexer.

19. An all-optical packet routing system, comprising:

a) first optical divider having first input and a plurality of outputs for receiving optical packets at said first input and directing said packets to each of said plurality of outputs, said optical packets having encoded headers and payloads, and

b) each of said plurality of outputs of said first divider includes a packet gate;

c) said packet gate, comprising:

i. second optical divider having second input and first and second outputs for receiving said optical packets at said second input and directing said packets to each of said first and second outputs;

ii. said first output includes a decoding device for decoding one of said encoded headers of one of said optical packets and to produces a pulse in response to one of said encoded headers propagating in said first output and a broadening device having at least one stable state for converting said pulse into a wide pulse, and

iii. an AND gate having third and fourth inputs and a third output, and

iv. said AND gates receives said wide pulse at said third input and one of said packets at said fourth input to produce time coincidence between said wide pulse and the pulses of the payload of one of said optical packets propagating in said third input to produce at said third output a signal similar to one of said payloads.

20. The system of claim 7 wherein said system is an optical packet demultiplexer.